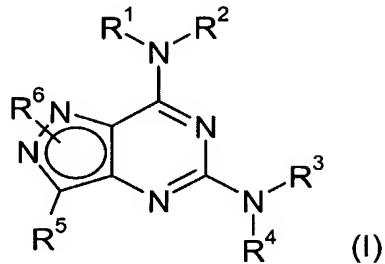


## Claims

## 1. A compound of formula (I)



wherein

$R^1$  is a cyclic group selected from  $R^A$ ,  $R^B$ ,  $R^C$  and  $R^D$ , each of which is optionally substituted with one or more  $R^7$  groups;

$R^2$  is hydrogen or  $C_1$ - $C_2$  alkyl;

$R^3$  and  $R^4$  are each independently  $C_1$ - $C_8$  alkyl,  $C_2$ - $C_8$  alkenyl,  $C_2$ - $C_8$  alkynyl or  $C_3$ - $C_{10}$  cycloalkyl, each of which is optionally substituted with one or more  $R^8$  groups, or  $R^E$ , which is optionally substituted with one or more  $R^9$  groups, or hydrogen;

or  $-NR^3R^4$  forms  $R^F$ , which is optionally substituted with one or more  $R^{10}$  groups;

$R^5$  is  $-Y-NR^{15}R^{16}$ ;

$R^6$ , which may be attached at  $N^1$  or  $N^2$ , is  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  haloalkyl,  $C_2$ - $C_6$  alkenyl or  $C_2$ - $C_6$  alkynyl, each of which is optionally substituted by  $C_1$ - $C_6$  alkoxy, ( $C_3$ - $C_6$  cycloalkyl)methoxy,  $C_1$ - $C_6$  haloalkoxy or a cyclic group selected from  $R^J$ ,  $R^K$ ,  $R^L$  and  $R^M$ , or  $R^6$  is  $R^N$ ,  $C_3$ - $C_7$  cycloalkyl or  $C_3$ - $C_7$  halocycloalkyl, each of which is optionally substituted by  $C_1$ - $C_6$  alkoxy or  $C_1$ - $C_6$  haloalkoxy, or  $R^6$  is hydrogen;

$R^7$  is halo,  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  haloalkyl,  $C_2$ - $C_6$  alkenyl,  $C_2$ - $C_6$  alkynyl,  $C_3$ - $C_{10}$  cycloalkyl,  $C_3$ - $C_{10}$  halocycloalkyl, phenyl,  $OR^{12}$ ,  $OC(O)R^{12}$ ,  $NO_2$ ,  $NR^{12}R^{13}$ ,  $NR^{12}C(O)R^{13}$ ,  $NR^{12}CO_2R^{14}$ ,  $C(O)R^{12}$ ,  $CO_2R^{12}$ ,  $CONR^{12}R^{13}$  or  $CN$ ;

$R^8$  is halo, phenyl,  $C_1$ - $C_6$  alkoxyphenyl,  $OR^{12}$ ,  $OC(O)R^{12}$ ,  $NO_2$ ,  $NR^{12}R^{13}$ ,  $NR^{12}C(O)R^{13}$ ,  $NR^{12}CO_2R^{14}$ ,  $C(O)R^{12}$ ,  $CO_2R^{12}$ ,  $CONR^{12}R^{13}$ ,  $CN$ ,  $C_3$ - $C_6$  cycloalkyl,  $R^G$  or  $R^H$ , the last two of which are optionally substituted with one or more  $R^9$  groups;

$R^9$  is  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  haloalkyl or  $CO_2R^{12}$ ;

R<sup>10</sup> is halo, C<sub>3</sub>-C<sub>10</sub> cycloalkyl, C<sub>3</sub>-C<sub>10</sub> halocycloalkyl, phenyl, OR<sup>12</sup>, OC(O)R<sup>12</sup>, NO<sub>2</sub>, NR<sup>12</sup>R<sup>13</sup>, NR<sup>12</sup>C(O)R<sup>13</sup>, NR<sup>12</sup>CO<sub>2</sub>R<sup>14</sup>, C(O)R<sup>12</sup>, CO<sub>2</sub>R<sup>13</sup>, CONR<sup>12</sup>R<sup>13</sup>, CN, oxo, C<sub>1</sub>-C<sub>6</sub> alkyl or C<sub>1</sub>-C<sub>6</sub> haloalkyl, the last two of which are optionally substituted by R<sup>11</sup>;

R<sup>11</sup> is phenyl, NR<sup>12</sup>R<sup>13</sup> or NR<sup>12</sup>CO<sub>2</sub>R<sup>14</sup>;

R<sup>12</sup> and R<sup>13</sup> are each independently hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl or C<sub>1</sub>-C<sub>6</sub> haloalkyl;

R<sup>14</sup> is C<sub>1</sub>-C<sub>6</sub> alkyl or C<sub>1</sub>-C<sub>6</sub> haloalkyl;

R<sup>15</sup> is selected from R<sup>17</sup>, R<sup>17</sup>C(O) and R<sup>18</sup>SO<sub>2</sub>, and

R<sup>16</sup> is selected from hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl optionally substituted with one or more R<sup>19</sup> groups, C<sub>1</sub>-C<sub>6</sub> haloalkyl and C<sub>3</sub>-C<sub>10</sub> cycloalkyl optionally substituted with one or more R<sup>20</sup> groups,

or -NR<sup>15</sup>R<sup>16</sup> constitutes a 3- to 8-membered saturated ring which may optionally include one or more further heteroatoms selected from nitrogen, oxygen and sulphur, and which may optionally be substituted with one or more groups selected from R<sup>21</sup>, R<sup>22</sup> and (C<sub>1</sub>-C<sub>6</sub> alkoxy)C<sub>1</sub>-C<sub>6</sub> alkyl;

R<sup>17</sup> is hydrogen or R<sup>18</sup>;

R<sup>18</sup> is selected from C<sub>1</sub>-C<sub>6</sub> alkyl optionally substituted with one or more R<sup>19</sup> groups, C<sub>1</sub>-C<sub>6</sub> haloalkyl and C<sub>3</sub>-C<sub>10</sub> cycloalkyl optionally substituted with one or more R<sup>20</sup> groups;

R<sup>19</sup> is selected from R<sup>21</sup>, -NR<sup>23</sup>R<sup>24</sup>, -CO<sub>2</sub>R<sup>25</sup>, -CONR<sup>26</sup>R<sup>27</sup>, R<sup>28</sup> and phenyl optionally substituted by R<sup>29</sup>;

R<sup>20</sup> is selected from R<sup>21</sup>, R<sup>22</sup> and oxo;

R<sup>21</sup> is oxo, hydroxy, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> (haloalkyl)oxy or C<sub>3</sub>-C<sub>7</sub> cycloalkyloxy;

R<sup>22</sup> is C<sub>1</sub>-C<sub>6</sub> alkyl or C<sub>1</sub>-C<sub>6</sub> haloalkyl;

R<sup>23</sup> and R<sup>24</sup> are each independently selected from hydrogen and C<sub>1</sub>-C<sub>6</sub> alkyl;

or -NR<sup>23</sup>R<sup>24</sup> constitutes an azetidine, pyrrolidine, piperidine or morpholine ring;

R<sup>25</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub> alkyl;

R<sup>26</sup> and R<sup>27</sup> are each independently selected from hydrogen and C<sub>1</sub>-C<sub>6</sub> alkyl;

or -NR<sup>26</sup>R<sup>27</sup> constitutes an azetidine, pyrrolidine, piperidine or morpholine ring;

$R^{28}$  is a saturated, unsaturated or aromatic heterocycle with up to 10 ring atoms, at least one of which is selected from nitrogen, oxygen and sulphur;

$R^{29}$  is selected from halo,  $R^{21}$  and  $R^{22}$ ,

$R^A$  and  $R^J$  are each independently a  $C_3$ - $C_{10}$  cycloalkyl or  $C_3$ - $C_{10}$  cycloalkenyl group, each of which may be either monocyclic or, when there are an appropriate number of ring atoms, polycyclic and which may be fused to either

- (a) a monocyclic aromatic ring selected from a benzene ring and a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur, or
- (b) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

$R^B$  and  $R^K$  are each independently a phenyl or naphthyl group, each of which may be fused to

- (a) a  $C_5$ - $C_7$  cycloalkyl or  $C_5$ - $C_7$  cycloalkenyl ring,
- (b) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur, or
- (c) a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

$R^C$ ,  $R^L$  and  $R^N$  are each independently a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated or partly unsaturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur, which ring may be fused to a  $C_5$ - $C_7$  cycloalkyl or  $C_5$ - $C_7$  cycloalkenyl group or a monocyclic aromatic ring selected from a benzene ring and a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;

$R^D$  and  $R^M$  are each independently a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur, which ring may further be fused to

- (a) a second 5- or 6-membered heteroaromatic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur;
- (b)  $C_5$ - $C_7$  cycloalkyl or  $C_5$ - $C_7$  cycloalkenyl ring;
- (c) a 5-, 6- or 7-membered heteroalicyclic ring containing up to three heteroatoms selected from nitrogen, oxygen and sulphur; or
- (d) a benzene ring;

$R^E$ ,  $R^F$  and  $R^G$  are each independently a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>H</sup> is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur; and

Y is a covalent bond, C<sub>1</sub>-C<sub>6</sub> alkylenyl or C<sub>3</sub>-C<sub>7</sub> cycloalkylenyl;

a tautomer thereof or a pharmaceutically acceptable salt, solvate or polymorph of said compound or tautomer.

2. A compound according to claim 1 wherein R<sup>1</sup> is R<sup>B</sup>, which is optionally substituted with one or more R<sup>7</sup> groups.

3. A compound according to claim 1 wherein R<sup>1</sup> is R<sup>D</sup>, which is optionally substituted with one or more R<sup>7</sup> groups.

4. A compound according to claim 1 wherein R<sup>7</sup> is halo, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> haloalkyl, OR<sup>12</sup> or CONR<sup>12</sup>R<sup>13</sup>.

5. A compound according to claim 1 wherein R<sup>2</sup> is hydrogen.

6. A compound according to claim 1 wherein R<sup>3</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, which is optionally substituted with one or more R<sup>8</sup> groups, or R<sup>E</sup>, which is optionally substituted with one or more R<sup>9</sup> groups; and wherein R<sup>E</sup> is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur.

7. A compound according to claim 1 wherein R<sup>4</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl or C<sub>2</sub>-C<sub>6</sub> alkynyl.

8. A compound according to claim 1 wherein -NR<sup>3</sup>R<sup>4</sup> forms R<sup>F</sup>, which is optionally substituted with one or more R<sup>10</sup> groups and wherein R<sup>F</sup> is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms containing at least one nitrogen atom and optionally one other atom selected from oxygen and sulphur.

9. A compound according to claim 1 wherein Y is C<sub>1</sub>-C<sub>6</sub> alkylenyl.

10. A compound according to claim 1 wherein R<sup>15</sup> is R<sup>17</sup>C(O) or R<sup>18</sup>SO<sub>2</sub> and R<sup>16</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub> alkyl.

11. A compound according to claim 1 wherein R<sup>15</sup> is R<sup>17</sup> and R<sup>16</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub> alkyl.

12. A compound according to claim 1 wherein  $-NR^{15}R^{16}$  constitutes a 3- to 8-membered saturated ring which may optionally include one or more further heteroatoms selected from nitrogen, oxygen and sulphur, and which may optionally be substituted with one or more groups selected from  $R^{21}$ ,  $R^{22}$  and  $(C_1-C_6\text{ alkoxy})C_1-C_6\text{ alkyl}$ .

13. A compound according to claim 1 wherein  $R^6$  is positioned on  $N^1$ .

14. A compound according to claim 1 wherein

$R^6$  is  $C_1-C_6\text{ alkyl}$  or  $C_1-C_6\text{ haloalkyl}$ , each of which is optionally substituted by  $C_1-C_6\text{ alkoxy}$ ,  $C_1-C_6\text{ haloalkoxy}$  or a cyclic group selected from  $R^J$ ,  $R^L$  and  $R^M$ , or  $R^6$  is  $R^N$  or hydrogen;

$R^J$  is a  $C_3-C_7$  monocyclic cycloalkyl group;

$R^L$  and  $R^N$  are each independently a monocyclic, saturated or partly unsaturated ring system containing between 4 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur; and

$R^M$  is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur.

15. A compound according to claim 1 wherein

$R^3$  is hydrogen,  $C_1-C_4\text{ alkyl}$ , which is optionally substituted with one or more  $R^8$  groups, or  $R^E$ , which is optionally substituted with one or more  $R^9$  groups;

$R^4$  is hydrogen,  $C_1-C_6\text{ alkyl}$  or  $C_1-C_6\text{ haloalkyl}$ ;

or  $-NR^3R^4$  forms  $R^F$ , which is optionally substituted with one or more  $R^{10}$  groups;

$R^6$  is  $C_1-C_4\text{ alkyl}$  or  $C_1-C_4\text{ haloalkyl}$ , each of which is optionally substituted by  $C_1-C_4\text{ alkoxy}$ ,  $C_1-C_4\text{ haloalkoxy}$  or a cyclic group selected from  $R^J$ ,  $R^L$  and  $R^M$ , or  $R^6$  is  $R^N$  or hydrogen;

$R^A$  is a monocyclic  $C_3-C_8$  cycloalkyl group;

$R^B$  is phenyl;

$R^C$  is a monocyclic saturated or partly unsaturated ring system containing between 3 and 8 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>D</sup> is a 5- or 6-membered heteroaromatic ring containing up to three heteroatoms independently selected from nitrogen, oxygen and sulphur;

R<sup>E</sup> is a monocyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>F</sup> is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>J</sup> is cyclopropyl or cyclobutyl;

R<sup>L</sup> and R<sup>N</sup> are each independently a monocyclic saturated ring system containing either 5 or 6 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>M</sup> is a 5- or 6-membered heteroaromatic ring containing a heteroatom selected from nitrogen, oxygen and sulphur; and

Y is C<sub>1</sub>-C<sub>6</sub> alkenyl.

16. A compound according to claim 15 wherein R<sup>1</sup> is a cyclic group selected from R<sup>A</sup>, R<sup>B</sup>, R<sup>C</sup> and R<sup>D</sup>, each of which is optionally substituted with one or more R<sup>7</sup> groups;

R<sup>7</sup> is halo, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> haloalkyl, OR<sup>12</sup> or CONR<sup>12</sup>R<sup>13</sup>;

R<sup>8</sup> is halo, phenyl, C<sub>1</sub>-C<sub>6</sub> alkoxyphenyl, OR<sup>12</sup>, NR<sup>12</sup>R<sup>13</sup>, NR<sup>12</sup>CO<sub>2</sub>R<sup>14</sup>, CO<sub>2</sub>R<sup>12</sup>, CONR<sup>12</sup>R<sup>13</sup>, R<sup>G</sup> or R<sup>H</sup>, the last two of which are optionally substituted with one or more R<sup>9</sup> groups;

R<sup>A</sup> is a monocyclic C<sub>5</sub>-C<sub>7</sub> cycloalkyl group;

R<sup>B</sup> is phenyl;

R<sup>C</sup> is a monocyclic saturated ring system containing between 5 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>D</sup> is a 5-membered heteroaromatic ring containing a heteroatom selected from nitrogen, oxygen and sulphur and optionally up to two further nitrogen atoms in the ring, or a 6-membered heteroaromatic ring including 1, 2 or 3 nitrogen atoms;

R<sup>E</sup> is a monocyclic saturated ring system containing between 3 and 7 ring atoms containing one nitrogen atom;

R<sup>F</sup> is a monocyclic or, when there are an appropriate number of ring atoms, polycyclic saturated ring system containing between 3 and 10 ring atoms containing at least one nitrogen atom and optionally one other atom selected from oxygen and sulphur;

R<sup>G</sup> is a monocyclic saturated ring system containing between 3 and 7 ring atoms, of which at least one is a heteroatom selected from nitrogen, oxygen and sulphur;

R<sup>H</sup> is a 5- or 6-membered heteroaromatic ring containing up to two nitrogen atoms; and

Y is -CH<sub>2</sub>-.

17. A pharmaceutical composition comprising a compound of formula (I) as claimed in claim 1, or pharmaceutically acceptable salts, solvates or polymorphs thereof, and a pharmaceutically acceptable diluent or carrier.

18. A method of treatment of a disorder or condition where inhibition of PDE5 is known, or can be shown, to produce a beneficial effect, in a mammal, comprising administering to said mammal a therapeutically effective amount of a compound of formula (I) as claimed in claim 1, or a pharmaceutically acceptable salt, solvate or polymorph thereof.

19. A method according to claim 18, wherein the disorder or condition is diabetes.

20. A method according to claim 18, wherein the disorder or condition is hypertension.